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REVIEW ARTICLE

# The Indications for Dilatation and Curettage

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**ABSTRACT**

**Historical aspects of dilatation and curettage are discussed and the indications reviewed for this procedure in three major age-groups: (1) childhood and adolescence, (2) maturity and reproductive period, (3) menopause and post-menopause. As the most frequently performed obstetrical and gynecological procedure, it is not an innocuous operation, and clear-cut indications for its use are presented with reference to abnormal vaginal bleeding in all age groups, infertility, functional ovarian tumours, neoplasia of the uterus, cervical biopsy, and major pelvic surgery. It is concluded that dilatation and curettage has a major place in the diagnostic and the therapeutic armamentarium of the thorough obstetrician and gynecologist.**

IN ANY discussion on the indications for an operation it is desirable first to understand clearly the operation itself. Present knowledge of the procedure generally known as "curettage" would seem to obviate this necessity. However, technical knowledge is incomplete unless based on an accurate understanding of the historical development and background of the procedure.

## HISTORICAL

Curettage is one of the oldest gynecologic operations. Ancient medicine was fraught with taboo and rituals but it is of interest to note that in spite of this, according to the Talmud, Hebrew women made attempts to diagnose the source of vaginal bleeding. By the use of a tubular vaginal speculum of lead containing a movable rod, a small sponge was introduced into the vaginal vault. If the external surface of the tube was blood-stained without involvement of the sponge, it was concluded that the bleeding did not come from the uterus.

In a study of the history of gynecology,[1] it becomes apparent that its early inception was dependent upon the development of use of some form of vaginal speculum. Soranos, who lived in 98-177 A.D., devoted an entire chapter to the use of the speculum in his book on gynecology. These instruments were ingenious two-bladed, three-bladed or four-bladed retractors.

The Alexandrian School, which flourished from 332 B.C. to 640 A.D., recorded in its writings that the speculum and the uterine sound were in general use at that time, so these instruments were known at least 2000 years ago.

Sparse historical writings fail to record the use of such instruments from about 1085 A.D. until the late fifteenth century when Ambroise Paré illustrated a vaginal speculum in one of his books. In 1761 Astruc of Paris "re-invented" the vaginal speculum and Recamier in 1801 reintroduced a tubular instrument of this nature to the profession. Some 25 years later he produced a bi-valve modification of the previous model.

The uterine probe or sound was known in the Hippocratic era, but the uterine dilator was first described in 1657 by Weirus.[2] Some of the vaginal specula were designed and probably used to dilate the cervix as well as the vagina. Various bougies were later introduced for dilatation, and by the early eighteenth century cervical dilators were widely used. These were of the two types—the graduated sound and the bi-valved dilator of the Goodell type.

The invention of the curette is also credited to Recamier who in 1843 introduced a small scoop or spoon on a long handle which he named the curette. This was devised for removal of small growths or other material from the cavity of the uterus. The operation which he named curettage and which he advocated, in spite of vigorous protests from many authorities, finally was generally accepted about 20 years later.

Strictly speaking, the term "dilatation and curettage" implies the combination of the two procedures mutually dependent and consecutive—dilatation of the cervix and curettage of the uterus.

From a practical standpoint nature will frequently complete the first part of the operation, leaving the curettement or evacuation of the organ for the operator. In this discussion it is my intent to consider all forms of this operation, whether the use of dilators is necessary or not, and whether or not an actual curette is used as the evacuating instrument.

The indications for dilatation and curettage usually fall into two major groups—diagnostic and therapeutic. Under certain circumstances these two overlap considerably, the diagnostic procedure becoming therapeutic during its performance. In dealing with patients this point should be stressed because many will hesitate to accept the recom-

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mendation of their physician that curettage be performed if it is recommended as a diagnostic measure only. With the knowledge that the procedure may well be curative, very little resistance will be encountered.

For the sake of clarity the life span of women will be divided into the three major periods: childhood and adolescence, maturity and reproductive, menopause and post-menopause.

### CHILDHOOD AND ADOLESCENCE

Vaginal bleeding in the newborn is self-limited and requires no operative investigation. Similarly, vaginal bleeding which occurs in the pre-pubertal child is rarely an indication for dilatation and curettage. Gentle rectal examination or visualization of the vagina with an otoscope or a Kelly "dry" cystoscope will suffice to rule out the presence of foreign bodies in the vagina. Traumatic perforations of the perineum, vagina or vaginal vault must always be considered a possibility in the female child who is found to have vaginal bleeding. We have observed several injuries of this type in which the girl had fallen over a sharp object and because of shyness or fear aroused by the bleeding had not confided in the parents. It is of paramount importance to examine such a child carefully in every case, but dilatation and curettage is seldom indicated.

Dysontogenetic tumours of the ovary may promote precocity with vaginal bleeding and other evidences of early maturation. In these cases endocrine assays and careful pelvic assessment, usually under anesthesia, will confirm the presence of an adnexal tumour. Diagnosis of certain congenital abnormalities in the child may also require examination under anesthesia, and perhaps dilatation of the vagina or the use of a uterine sound, but seldom is curettage necessary.

The presence of a malignant tumour of the uterus and cervix in a child, such as sarcoma botryoides, is usually easily recognized and biopsy of the extruding tumour is diagnostic, without recourse to dilatation and curettage. Papanicolaou smears should always be done in the presence of a suspected neoplasm in a child, before resorting to dilatation and curettage.

Fortunately it is rarely necessary to use surgical means to control excessive menstrual bleeding of adolescence.

Rectopelvic examination should be performed to rule out gross abnormalities. General supportive treatment and reassurance usually suffices to meet these problems. Occasionally temporary use of hormone therapy, either in the form of intravenous estrogens for immediate control of bleeding, or progestational therapy to regulate the cycle, will be effective.

The trauma (to such developing tissue) resulting from dilatation and curettage can be considerable and sometimes has a permanent effect, and for this reason the operation should be avoided as far as possible.

### MATURITY AND REPRODUCTIVE PERIOD

With the assumption of maturity and the active reproductive role the female becomes prone to many abnormalities of the generative organs. These abnormalities are evidenced by several symptoms of which the most frequently observed is some aberration in menstrual function. Dilatation and curettage is the most frequent gynecologic operation in such situations; its diagnostic value is unquestioned.

The causes of abnormal bleeding may be classified under the following four types: (1) pregnancy and its complications; (2) inflammatory conditions; (3) neoplasms—benign and malignant; and (4) dysfunctional uterine bleeding. In each type, curettage has a definite place either in diagnosis or in treatment.

#### 1. PREGNANCY AND ITS COMPLICATIONS

*Abortion*

When is dilatation and curettage indicated in cases of abortion? Impelled by the now prevalent shortage of hospital beds, more and more early abortions are being dealt with conservatively in the patient's home. One must base one's decision to follow such a course on several factors, but the most important is the length of gestation. The separation and expulsion of a conceptus is much more likely to be complete and accompanied by minimal blood loss, infection, etc., when the pregnancy terminates in the first eight weeks. The second important factor is the amount of associated blood loss. Any blood loss which is more than the normal menstrual loss for that individual, and which persists at that increased level for longer than two to four hours, requires hospital care and active intervention, even in the early abortion. The two cardinal indications for curettage are the passage of tissue and uncontrolled bleeding.

We prefer to treat in the hospital most abortions that occur after eight weeks' gestation. We believe that the majority of such cases if other than threatened in type (including apparent complete abortions) should have the benefit of curettage. If the abortion is inevitable or incomplete, the cervix may require very little in the way of dilatation, so that the operation becomes one of curettage alone. Hospital stay will be shortened and readmission for persistent or recurrent bleeding will be reduced to a minimum by early active intervention in all hospitalized cases.

In such cases it is our preference to use digital curettage if at all possible without the actual use of a curette. The use of the latter entails a nicety of technique—not in the possession of all—to clear the uterus of its contents without inflicting unnecessary trauma to the myometrium. It is next to impossible to do damage with the gloved finger,

and, in addition, it is possible by direct palpation to feel the inside of the uterus, recognize genital abnormalities and detach adherent secundines effectively.

If the bleeding is not excessive and if there is evidence of infection, we prefer to culture the endocervix and then to place the patient on suitable antibiotic therapy for about 24 hours before proceeding with curettage. We usually begin therapy in the febrile case with combined penicillin (600,000 units) and streptomycin (0.5 g.) twice daily, leaving the broad-spectrum antibiotics for use after a report on the culture and sensitivity of the responsible organism is available. The use of intravenous synthetic oxytocin (Syntocinon) infusion may be helpful during this waiting period to promote spontaneous termination of the abortion.

Septic abortion sometimes progresses into that extremely dangerous condition known as septic or bacteremic shock. In every case the products of conception are still retained when the patient suddenly goes into profound shock without evidence of excessive blood loss. Blood transfusions fail to restore normotensive blood pressures and the patient's condition rapidly deteriorates. Rapid and heroic measures must be adopted to prevent death. These include massive doses of antibiotics intravenously, vasoconstricting drugs and corticosteroids. The most important part of the therapy is immediate emptying of the uterus.[3] Some authorities recommend immediate vigorous sharp curettage, others immediate hysterectomy, while still others recommend less vigorous evacuation of the uterine contents. It must be remembered that recovery will not occur until the uterus is emptied.

In cases of missed abortion, dilatation and curettage should be withheld, if at all possible, until spontaneous abortion occurs. Attempts at dilatation and curettage may be extremely dangerous. Severe hemorrhage and sepsis may occur and ill-timed efforts to empty the uterus may terminate fatally. The growing tension in such patients, after a positive diagnosis is made and when no definite treatment is being given, is a familiar experience. It is wise to postpone intervention until the cervix becomes shortened and softened so as to make safe dilatation possible. Again the use of oxytocic infusion is sometimes advantageous. It is also of paramount importance to check the blood regularly for possible clotting defects. If bleeding becomes excessive or prolonged in the presence of a hard undilated cervix, abdominal hysterotomy may be preferable to attempts at curettage from below.

*Ectopic Gestation*

Is dilatation and curettage of any value in cases of suspected extrauterine pregnancy?. Although it is rarely indicated in the classic case, it is sometimes helpful in the patient whose findings are confusing. If the bleeding is unusually profuse, in the early case it may be essential to rule out an inevitable abortion by dilatation and curettage. Of interest in this respect is the so-called "dry scrape", in which curettage fails to obtain any demonstrable tissue. With the exception of the postmenopausal woman, in no other circumstances does one obtain no tissue on curettage. In the case of an ectopic pregnancy, the decidua has been totally shed but the presence of the pregnancy in the tube temporarily prevents reconstitution of the endometrium.

With the finding of decidua alone, without chorionic tissue on microscopic examination of the uterine contents after curettage, the diagnosis of extrauterine pregnancy must be seriously considered. In many such instances the presence of an ectopic gestation may not even have been suspected.

*Hydatidiform Mole*

Hydatidiform mole is a rare condition which in many instances is a major diagnostic problem. Confirmatory evidence of the disease, by the passage of molar tissues in the vaginal discharge, is rare until actual abortion has begun.

Dilatation and curettage in the management of this condition should be reserved for those cases in which the diagnosis has been made. After spontaneous expulsion of the mole the immediate treatment is thorough curettage, as in any inevitable abortion.

If the mole has not been expelled, repeated medical stimulation of the uterus with oxytocic intravenous infusions should always be tried before curettage is performed.

In cases in which medical induction fails and the uterus is larger than a 12-week pregnancy, many authorities prefer abdominal hysterotomy in order to ensure a more thorough evacuation of the mole under direct vision.

2. INFLAMMATORY CONDITIONS

The use of dilatation and curettage is contraindicated in the presence of most pelvic inflammation, with two exceptions. It may be indicated in the treatment of chronic endocervicitis with cervical erosion, and occasionally as a diagnostic procedure when tuberculosis of the pelvis is suspected. In the former instance, curettage is used in conjunction with cauterization of the cervix, which should be done only after cytological screening has shown the cervical condition to be benign. The usual precautions in such treatment need no emphasis.

3. NEOPLASMS—BENIGN AND MALIGNANT

It is in the field of uterine cancer detection that dilatation and curettage is *the* essential diagnostic method. It is probably used more often for this indication than for any other. One of the prime objectives and responsibilities of the gynecologist is to rule out cancer, and thus in every case of "possible malignancy" this operation is mandatory.

Cases of "possible malignancy" may present with abnormal vaginal bleeding (principally of the metrorrhagia type), contact bleeding, or abnormal uterovaginal discharges (even non-sanguineous), or they may present with no symptoms of any kind.

Since the acceptance of screening by cytological smears in the diagnosis of malignancy, more and more early unsuspected malignant lesions of the cervix are being found. Many of these patients present with no symptoms or objective signs but the smear shows the presence of malignant cells. In all such cases it must be remembered that the cytological smear is merely a complementary aid to diagnosis and that these patients must have a cervical biopsy. It is essential that dilatation and curettage be performed at the time of cervical biopsy, to facilitate adequate tissue removal in the region of the squamocolumnar junction, and to explore the uterine body for other abnormalities.

In the case of suspected endometrial cancer, unfortunately, cytological methods are much less satisfactory, and actual curettage must be employed. Thus, if vaginal bleeding is present and cervical lesions have been excluded by cytological methods, dilatation and careful curettage of the entire uterine cavity is indicated. No reliance can be placed on the so-called endometrial biopsy because of its incompleteness and because of the obvious chance of missing a small focus of the disease.

When is curettage indicated in cases of benign neoplasms of the uterus? The most common benign growth is the adenomatous polyp of the cervix. The removal of such polyps should always be a hospital procedure in spite of the temptation to treat them in one's office.

The frequent association of a cervical polyp with endometrial polyps or with other endocervical polyps emphasizes the necessity for dilatation and curettage in all such patients. More effective removal is possible with less chance of recurrence or of untoward bleeding. Microscopic examination of the removed tissue is essential in spite of the low incidence of malignant change, and it is much more likely to be done if the patient has been treated in hospital by proper curettage.

Fibroids of the uterus are generally not treated by curettage when they become symptomatic. However, situations arise in the presence of fibroids which require curettage. If a submucous fibroid becomes polypoid and is being extruded through the cervical os, it should be removed from below. Depleting menorrhagia in the presence of fibroids in a young woman may sometimes be effectively controlled by curettage, or by the removal of the associated unsuspected endometrial polyp which is so frequently present. Dilatation and curettage may even be palliative at times; for example, to control menorrhagia in the patient who has some specific reason for avoiding more extensive surgery, such as a pre-marital situation or when pregnancy is being planned.

4. DYSFUNCTIONAL UTERINE BLEEDING

By definition this entity implies that the bleeding is from an apparently normal uterus and appendages and is variously termed functional or dysfunctional. When this clinical diagnosis is made, one excludes pregnancy, neoplasms, inflammation and iatrogenic causes. There are two types of bleeding which cannot be excluded on clinical examination alone: that resulting from hyperplasia of the endometrium, and that type of bleeding of unknown origin which occurs in the presence of a normal endometrium and normal generative organs.

It is obvious therefore that the diagnosis of dysfunctional bleeding can be made only after curettage and examination of the endometrium. So again this operation is mandatory in reaching a diagnosis. Fortunately it is also highly successful as a therapeutic measure, because up to 80% of these patients will be permanently cured by the operation alone.[4]

It is imperative that a concise history relative to blood loss and exact timing of bleeding episodes be obtained before embarking on any surgical treatment of uterine bleeding. This is especially important in cases of "dysfunctional" bleeding.

If the general condition of the patient does not substantiate the history of excessive bleeding (if no anemia is evident), it may be well to temporize and to reassure the patient without recommending immediate curettage. There are great personal variations in interpretation of blood loss by individual patients. Some patients may be greatly disturbed by irregularities of menses, but unless the frequency is less than 18-20 days, and unless accompanied by excessive amounts, prolonged flow or passage of clots, the irregularity should be discounted. A single episode of prolonged or excessive bleeding may well be watched, but recurrent successive attacks should be treated by curettage.

Intermenstrual bleeding not associated with ovulation, occurring in one cycle only, can likewise be observed without operation, but when it occurs over two or more cycles, curettage should be recommended.

Post-coital bleeding which occurs in the absence of obvious gross lesions of the cervix, such as erosion or polyp, should be investigated first by a cytological smear. If the bleeding persists even with a negative smear, dilatation, curettage and ring biopsy of the cervix is indicated.

A possible exception to these relative indications for this operation applies to the patient who is in her late teens or early twenties. If there is severe, persistent, recurrent menorrhagia or meno-metrorrhagia in such a patient, with obvious systemic effects such as anemia, curettage should be done after blood dyscrasias have been excluded. However, it is in this group that we feel justified in a trial of hormone therapy before curettage if the pelvic organs are essentially normal to palpation.

Although 80% of patients with dysfunctional bleeding are cured by curettage, 20% remain who

will return with persistent symptoms of bleeding. The question of repeat curettage immediately arises, and in our opinion this is warranted in most women under the age of 40.

One must be influenced to some degree by the microscopic report on the endometrium following the first curettage. If the findings were those of normal endometrium, or even cystic hyperplasia of the "Swiss cheese" type, a repeat curettage can be expected to cure about two-thirds of the recurrent 20%. If, however, the diagnosis of adenomatous glandular hyperplasia is made, because of the high incidence of malignancy arising in such an endometrium, more radical procedures should be seriously considered.

### *Dysmenorrhea*

The operation of dilatation and curettage was once widely used in the treatment of dysmenorrhea. The results were questionable, although at times there was some temporary improvement. More recently the trend has been to medical endocrine therapy in these cases. In cases of intractable incapacitating dysmenorrhea, which constitute less than 5% of patients who seek relief for menstrual discomfort, abdominal exploration with presacral neurectomy is occasionally considered. Before recommending such surgical treatment, it is mandatory first to perform dilatation and curettage. The disruption of the nerve supply to the cervix which results from thorough dilatation may give considerable relief. It is our opinion that major surgical intervention should never be done before exhausting all other possible means of relief.

### *Infertility*

In the investigation of the infertile female, dilatation and curettage is an important procedure. The operation in its simplest form, that is, endometrial biopsy, is most widely used to prove the occurrence and time of ovulation. This is usually done on the first day of the menses, to avoid any possibility of disturbing an early pregnancy. If more exact data as to the date of ovulation are required, endometrial biopsy should be done about the twenty-second day of the normal cycle.

In addition to simple endometrial biopsy it is often necessary to perform a complete dilatation and curettage. By opening the cervix it is possible to rule out various degrees of stenosis or intracervical synechiae, polyps, congenital abnormalities of the cavity and submucous myomata. Dilatation of the cervix in many instances seems to have a stimulating effect both on ovulation and on the normal activity of the uterus.

## THE MENOPAUSE AND POST-MENOPAUSE

As a woman nears the end of her reproductive activity, she approaches a particularly dangerous time in her life. The incidence of malignant neoplastic disease increases. At and following the menopause it is imperative that every effort be made to "screen" such age groups routinely so as to be able to make an early diagnosis and to institute prompt treatment if necessary.

One must arbitrarily decide when the patient is to be considered menopausal. The signs and symptoms are widely variable. It is our custom to consider that nine months of amenorrhea after the last menstruation in a woman of appropriate age should justify the diagnosis of the menopause. Any vaginal bleeding after such elapsed time must be considered abnormal and post-menopausal.

Because malignancy is responsible for the bleeding in at least 50% of these patients, prompt investigation by curettage must be carried out. If there is a history of medication with estrogens prior to the episode, it may be possible to temporize while the effects of the medication wear off. It usually requires a few days to stop the bleeding of estrogen withdrawal. If it does not cease in seven days or recurs spontaneously, dilatation and curettage must be performed at once. It is well to remember that carcinoma of the uterus may, of course, occur in the patient receiving estrogen "menopausal" treatment.

The postmenopausal woman who complains of vaginal discharge of a non-sanguineous type, or who is found to have an unnatural amount of mucoid vaginal secretion more in keeping with the normal secretion of a premenopausal woman, should have the benefit of curettage. Frequently this type of discharge is the earliest evidence of fundal carcinoma.

It must also be stressed that any excessive, too frequent, or too prolonged menses at the time of the menopause must be viewed with suspicion. All such patients must receive a curettage if we are to eliminate carcinoma. It is a great error to accept the "change of life" as a cause for such abnormalities as is common practice among members of the public.

Pyometra is a condition which most commonly occurs in postmenopausal women. The formation of a pyometra is, of course, dependent on complete obstruction to drainage from the uterine cavity. Its high incidence of association with malignancy of the canal or endometrial cavity should alert the physician to the possible presence of this condition. The most relevant clinical findings on pelvic examination are a globular enlargement of the uterus and a shortening or effacing of the cervical part of the uterus with a smooth rounded intact external cervical os. Usually there is no history of vaginal bleeding or discharge. Dilatation of the canal confirms the diagnosis and it is wise to postpone any curettage until the uterus has drained completely, as evidenced by a reduction in its size. At a second operation a much clearer assessment of the intrauterine lesion is usually possible and curettage frequently reveals neoplastic change.

Dilatation and curettage is an essential preliminary to irradiation treatment for cancer of the uterus. If intrauterine applicators containing radium are to be used, the reason for this is perfectly obvious. It is of equal importance to use preliminary curettage before embarking on a course of external irradiation by cobalt or other radioactive agents. The diagnosis must be confirmed and the extent of the disease clearly estimated before proceeding with such potentially dangerous therapy.

### DILATATION AND CURETTAGE AS AN ADJUNCT TO MAJOR SURGERY

Is routine curettage necessary before pelvic laparotomy or repair procedures? Although this use of the operation is largely a diagnostic one, in certain instances preliminary curettage may confirm the presence of some condition for which the major procedure contemplated is unnecessary. Thus needless surgery may be avoided. The other basic need for the procedure is to rule out unsuspected malignancy.

Academic custom has gradually accepted and recommended preliminary curettage before any vaginal operation. It does not materially lengthen the operating time or complicate the preparation for operation and thus is strongly recommended by many.[5] It is our opinion that the use of curettage before vaginal hysterectomy should be reserved for the patients in the premenopausal age group, those with an enlarged uterus, and those who have been bleeding abnormally. It would hardly seem indicated as a routine procedure in all cases of complete prolapse, including those patients with a tiny postmenopausal uterus which is not bleeding. Even if such a uterus, on removal, is found to contain a small area of fundal carcinoma, the prognosis will not be materially altered.

In every patient in whom the planned repair operation will result in preservation of the uterus, preliminary curettage should be done. Accurate diagnosis is only possible by diagnostic curettage and is the keynote to effective treatment.

When one considers the use of curettage routinely before pelvic laparotomy, there is much less general acceptance of its use. Gynecologic laparotomies are usually divided into three types: those involving removal of the uterus, those involving the preservation of the uterus, and those in which it is impossible to know preoperatively whether or not the uterus will have to be removed.

It is of much greater importance to do a preliminary curettage before the operation in which the uterus is to be preserved than in the one involving planned removal of that organ. Thus all myomectomies, operations for ovarian cysts, suspensions, tubal operations, etc., should be preceded by curettage. Preoperative dilatation and curettage is probably equally important in the third type of laparotomy, in which it is impossible to know preoperatively how extensive the surgery must be. Frequently the diagnosis will be clarified or at least any endometrial lesions will be excluded, and a decision at laparotomy, regarding the nature of surgical procedures indicated, may be reached more easily.

When should curettage precede laparotomy involving planned removal of the uterus? A common error of omission is the failure to assess completely the condition of the cervix in the presence of uterine fibroids. There is really no excuse for acceptance of the presence of fibroids as sufficient explanation for irregular vaginal bleeding. The minimal investigation demanded includes cytological smears, followed by curettage and cervical biopsy if necessary, before proceeding with a hysterectomy in such cases. It is only in this way that one can exclude cervical cancer and avoid the serious and frequently fatal error of finding unsuspected epidermoid carcinoma in a uterus removed because it contained fibroids.

### SUMMARY

The history of dilatation and curettage has been briefly outlined. This operation enjoys a wide usage, serving both diagnostic and therapeutic functions. The indications for the operation are discussed. It is an essential procedure in the diagnosis and treatment of all aberrations of menstruation. Its use is of paramount importance in the early recognition of cancer of the uterus.

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## PAGES OUT OF THE PAST: FROM THE JOURNAL OF FIFTY YEARS AGO

### PUZZLES IN SYPHILIS

Why are the pathological findings in paresis and tabes so absolutely distinctive? And why do they differ so radically from those observed in nervous syphilis? Can it be due to the personal equation, or to the neurotoxic action on the part of the spirochetes? Six men infected with lues from the same woman all developed paresis. Of three men who were infected in one night by the same person, one developed tabes and two paresis. Brosius mentions five glass blowers who contracted simultaneously a chancre of the lip from their occupation, of whom four developed tabes and one paresis. The simple fact would seem to be that nervous syphilis, paresis and tabes are but varied expressions of a far reaching reaction to the spirochaeta pallida.—C. E. Riggs: *Canad. Med. Ass. J.*, **4**: 10, 1914.